Route to:

Return to:

INSTITUTE OF GAS TECHNOLOGY

THE GAS INDUSTRY'S OWN EDUCATIONAL AND RESEARCH FACILITY

CHICAGO 16, ILLINOIS

GAS ABSTRACTS

VOLUME 6, NUMBER 12

DECEMBER, 1950

AFFILIATED WITH

ILLINOIS INSTITUTE OF TECHNOLOGY

CONTENTS

1. Gas Industry 217
2. Appliances 217
3. Combustion and Industrial Furnaces 218
4. Carbonization and Gasification 219
5. Natural Gas and Natural Gas Condensates 223
6. Petroleum and Synthetic Liquid Fuels 227
7. Analytical Methods and Tests 230
8. General and Physical Chemistry 231
10. Chemical Engineering 233
11. Process Equipment and Instrumentation 234
12. Materials of Construction 235

GAS ABSTRACTS is published and distributed monthly by the Institute of Gas Technology, Chicago 16, Illinois. The contents of selected papers and patents are reviewed impartially by the editorial staff and material of potential interest to the Gas Industry is presented. Subscription rates to non-members of the Institute: $15.00 per year.—Printed in the U.S.A.

Copyright 1950 by the Institute of Gas Technology.

1. GAS INDUSTRY

Steel Scarcity

Logan, L. J. STEEL SCARCITY THREATENS OIL AND GAS INDUSTRIES. *World Oil* **131**, 50, 52 (1950) *November*.

Total steel needs of oil and gas industries will be at a record high in 1951 because of record use of both oil and gas. It is threatened that those requirements may not be fully supplied, under government allocations. Suppliers of steel declare that drilling can be maintained on the present basis of more than 40,000 wells annually for the rest of 1950 and through 1951 if there is no stockpiling and if military needs are not further increased.

Excerpt from article

2. APPLIANCES

Interchangeability

Brenner, E. C. GASES FOR SUPPLEMENTING NATURAL GAS IN MILWAUKEE. Paper presented at the Annual Meeting of the American Gas Association, Operating Section, Atlantic City, October, 1950.

A series of mixtures of natural gas, coke oven gas, oil gas, LP gas, and air were tested on a set of appliances and burners adjusted on natural gas. These tests showed that no substitute gas was 100% interchangeable with natural gas. Tests did prove that by adjusting appliances with propane-air gas both oil gas and natural gas were 100% interchangeable.

D. L. Nicol

Henry, H. M. INTERCHANGEABILITY OF GASES. *Gas Age* **106**, 36-42, 66-68 (1950) *October* 12.

A review of past and present laboratory studies of interchangeability coupled with actual case histories is presented. Conclusions on present data show that substitute gases thus far produced are not interchangeable without appliance adjustment. Preadjustment with substitute gas can result in interchangeable operation.

D. L. Nicol

Shnidman, L. and Yeaw, J. S. THE EFFECT OF THE COMPONENTS OF FUEL GASES ON BURNER FLAME CHARACTERISTICS AND INTERCHANGEABILITY. Paper presented at the Annual Meeting of the American Gas Association, Operating Section, Atlantic City, October, 1950.

Data for the characteristic burner numbers as determined by a Rochester Test Burner was presented on a series of binary mixtures of natural gas or propane with hydrogen, nitrogen, carbon dioxide, carbon monoxide and air. A method of calculating characteristic burner numbers for complex mixtures of these gases using the data of binary mixtures was presented. Prediction of lifting and blow-off was checked with data on complex mixtures.

D. L. Nicol

Ranges

Klein, G. (assigned to Caloric Stove Corp.) FUEL CONTROL ADAPTER FOR GAS STOVES. U.S. 2,524,130 (1950) *October* 3.

A method is proposed that affords a safety shut-off of fuel to the pilot and burner of a range oven in the event of flame failure. A thermocouple element is used for generation of an electromotive force to hold the gas shut-off valve open as long as the thermocouple is hot.

D. L. Nicol

3. COMBUSTION AND INDUSTRIAL FURNACES

Burners

Hill, N. E. (assigned to L. J. Mueller Furnace Co.) GAS BURNER WITH ADJUSTABLE FLAME SLOT AND CENTRAL SECONDARY AIR SUPPLY. U.S. 2,526,748 (1950) *October* 24.

A burner is described for use in heat exchange equipment. The novel features are a secondary air supply to both sides of the annular flame and a simple adjustment of port area for different gases.

D. L. Nicol

Kobabe, J. M. A COMPARISON BETWEEN ATMOSPHERIC AND FORCED DRAFT BURNERS. *Gas* 26, 58-59 (1950) *October*.

A comparison of atmospheric and forced draft burners for heat transfer equipment is presented. Forced draft is advocated as being more advantageous in reducing capital costs and increasing present capacities at minimum cost. Other relative advantages of forced draft are found in more efficient operation, high safety factor, and less susceptibility to atmospheric conditions.

D. L. Nicol

Furnace

Remmy, G. B. SEMISILICA REFRACTORIES LESSEN FURNACE STRUCTURAL FAILURES. *Steel* 127, 62-64, 66, 68 (1950) *November* 27.

Semisilica brick is obtained from a mixture of silica and kaolin clay and may have either a 76 to 78% or 72% silica content. Results from various tests show that this brick has better characteristics than the high heat heavy duty clay brick for arched roofs and walls of various types of furnaces. It is more resistant to structural spalling and plastic flow properties; however, its resistance to thermal spalling is not as good.

S. Mori

Gas Turbine

Willis, C. C. and Goldsworth, E. C. THE HUEY GAS TURBINE. *Mech. Eng.* 72, 881-885 (1950) *November*.

Operating results of a natural gas-fired open-cycle locomotive type gas turbine generator unit nominally rated at 3500 KW are reported. The gas turbine unit, installed at the Huey Station of Oklahoma Gas and Electric Co., has run continuously for some 3900 hours at an average load of 3959 KW and has required little or no maintenance. A description is given of construction details and engineering problems involved in the installation, including also schematic diagrams of component parts of the turbine and feed water and cooling water systems.

C. Von Fredersdorff

Incineration of Hydrocarbon Vapors

Ruff, R. J. CATALYTIC COMBUSTION OF HYDROCARBON VAPORS. *Ind. Heating* 17, 1736, 1738, 1740, 1880, 1882, 1884, 1886 (1950) *October*.

Catalytic incineration of hydrocarbon fumes has been developed to prevent atmospheric pollution. In operation, the combustion of the contaminant with oxygen is carried out by passage over a catalytic element at an entry temperature of approximately 500°F. Depending on the concentration of the hydrocarbon, the temperature may rise to above 1200°F. Sulfurous fumes cannot be handled since additional treatment would then be needed to remove sulfur dioxide. Metal vapors such as mercury and zinc poison the catalyst. Various installations are described. In cases where the fume temperature is below 500°F, the additional heat can be supplied by means of a gas burner or other means.

C. H. Riesz

Oven

Sage, A. M. (assigned to Steiner-Ives Co.) DIRECT GAS-FIRED OVEN. U.S. 2,524,272 (1950) *October* 3.

An oven is described that affords a high humidity, high temperature gas stream for drying

and baking of cores, molds, shapes and other forms of products formed of sand, gypsum, plastics and other materials.

D. L. Nicol

The following article, the abstract for which appears on the page indicated, is also called to your attention:

Grove, J. R., Hoare, M. F. and Linnett, J. W. THE SHADOW CAST BY A BUNSEN FLAME...p. 231.

4. CARBONIZATION AND GASIFICATION

Carbonization

Davis, J. D., Reynolds, D. A., Wolfson, D. E., and Birge, G. W. COMPARISON OF BM-AGA AND SLOT-OVEN EXPERIMENTAL METHODS OF CARBONIZATION, WITH RESULTS FOR ELEVEN COALS. U.S. Bureau of Mines Bulletin 480 (1950).

A comparison is presented of the results of carbonization tests in the BM-AGA 18-inch retort and the Illinois Geological Survey slot type oven (14-inch width). Three high volatile coals and 8 blends of coals of different ranks were carbonized at 800° and 900° C in the BM-AGA and at 870 to 1010° C in the slot oven. Coke yields approximate those of the 800° retort test. The coke properties and the gas yields of the slot oven were intermediate between those of the 800° and 900° C retort tests. Gas from the slot oven is leaner than from either retort test. Tar, light oil and ammonium sulfate yields were slightly lower for the slot oven. Properties of the coals and the products are tabulated and also compared graphically.

O. P. Brysch

Davis, J. D., Reynolds, D. A., Brewer, R. E., Ode, W. H., Naugle, B. W., Wolfson, D. E. and Birge, G. W. CARBONIZING PROPERTIES: WEST VIRGINIA COALS FROM THE EAGLE, NO. 2 GAS, POCAHONTAS NO. 3 AND POCAHONTAS NO. 4 BEDS. U.S. Bureau Mines Bulletin 493 (1950).

Results of tests on two high-volatile and two low-volatile West Virginia coals and on five blends of these coals are reported. Analyses, plastic properties, yields and analyses of carbonization products and expansion properties are presented in tabulated and graphical form, with detailed discussions and comparisons. The coals when blended in proper proportions are suitable for the manufacture of oven coke, but require proper precautions to avoid damaging expansion tendencies.

O. P. Brysch

Dowd, J. J., et al. ESTIMATE OF KNOWN RECOVERABLE RESERVES OF COKING COAL IN CAMBRIA COUNTY, PENNSYLVANIA. U. S. Bureau of Mines Report of Investigations 4734 (1950) October.

This report is the first in a series covering in detail, by counties, the estimated *known minable* coking-coal reserves. Such a study, requested by the Department of Defense, will cover three phases; (1) determination from available data of coking coal reserves economically minable by present and by possible future methods, (2) study of the carbonizing properties of these reserves, singly and in blends (3) study of preparation characteristics to show suitability of coal for producing metallurgical coke; (a) as mined or after present preparation methods, or (b) after special or intensive treatment. The completed study will serve the purpose of (a) providing an inventory of suitable reserves, (b) providing an inventory of reserves of coal now unsuitable, but possibly adaptable in the future, and (c) locating the areas in which further exploratory work is needed. Cambria County contains four major coal beds: Upper Freeport (E), Lower Freeport (D), Upper Kittanning (C') and Lower Kittanning (B), and three minor beds. Reserves in all beds over 14 inches thick are estimated at 2,407 million short tons as of January 1, 1948. Of this total, 1,909 million tons are in beds 28 inches or over, which is the recoverable reserve under present practice. The weighted average recovery for all beds is 48.77% at present. The coals are all coking, and principally low-and medium- volatile bituminous. Chemical and carbonizing properties and preparation data are reviewed briefly, with tables. Tabulated data and areal maps of each bed are included.

O. P. Brysch

Coal Properties

Boas-Traube, S. G. and Dryden, I. G. C. VISCOSITY OF SOLUTIONS OF COAL IN ETHYLENE DIAMINE. *Fuel* (British) **29**, 260-261 (1950) *November*.

The relatively low intrinsic viscosity of coal extract in solution—about 10 in dimensionless units—indicates, when taken in conjunction with recently published evidence that the soluble units are predominantly of colloidal size, that the coal extract particles are not far from spherical in shape. In the course of this work, the temperature variation of the viscosity of ethylene diamine over the range 20° to 70° C has been measured.

Authors' abstract

Dryden, I. G. C. MODE OF ACTION OF SPECIFIC SOLVENTS FOR BITUMINOUS COALS. *Nature* (British) **166**, 606 (1950) *October 7*.

In the treatment of low-rank coals with specific solvents, conditions such as coal to solvent ratio and successive treatment which have a considerable effect upon yield of extract are due largely to mechanical causes. Thus, agitation, although increasing the rate of solution, has an adverse effect upon yield per treatment. However, by successive treatment, a maximum yield may be obtained dependent upon coal type, solvent and temperature. With best solvents and lowest coal-ranks and ideal mechanical treatment, the concentration of extract appears to be the same in the solvent within the micropores and in the bulk solution outside. Above a certain concentration value, aggregation of the dissolved material occurs in the bulk solution, causing increase in apparent yields. At high imbibition ratios, the extract yield is determined chiefly by the size distribution of the colloidal units as related to the largest soluble unit. In low imbibition ratios, the yield is controlled by the difficulties of disengagement or micellar sieve action upon the dissolved unit. When the imbibition ratio exceeds unity, the temperature coefficient of extract yield ceases to change further with rank.

O. P. Brysch

Monkhouse, A. C. THE MINOR CONSTITUENTS OF COAL. *Coke & Gas* (British) **12**, 363-368 (1950) *October*.

The minor elements of coal are reviewed briefly with respect to occurrence, proportion, nature of combination and reactions during combustion or carbonization. Nitrogen and sulfur are discussed in more detail as a class of special importance. Phosphorus, chlorine, fluorine and arsenic are discussed with emphasis on their deleterious influences in the utilization of the coal. Boron, germanium, gallium, vanadium and other "trace" elements, with exceptional concentrations in certain vitrains, are explained as elements required in plant metabolism. Concentrations of these elements in British coals are tabulated.

O. P. Brysch

Mott, R. A. SULFUR IN COKING COAL. *Coke & Gas* (British) **12**, 369-370 (1950) *October*.

The importance of sulfur in coking coal is discussed in the light of the decreasing quality of available metallurgical fuel. The new analytical method of the British Coke Research Association, for differentiating between pyritic and sulfate sulfur is described and recommended. It is a modification of the Powell and Parr method, and is designed to reduce the time of analysis by using stronger reagents and higher temperatures in the extractions.

O. P. Brysch

Sherlock, E. STUDIES ON SOME PROPERTIES OF ALBERTA COALS. I. DENSITY. *Fuel* (British) **29**, 245-252 (1950) *November*.

The true and apparent densities of a number of Alberta coals have been measured for purposes of comparison with similar measurements on other coals. A relationship between true specific volume, hydrogen content and oxygen content has been shown. Measurements on the density of Alberta coals in xylene, together with data on the penetration of a coal by xylene and tetralin, have led to a partial evaluation of the distribution of pore size in these coals, and to attempts to estimate the size and shape of the finer pores. A tentative attempt has been made to link the change of density and of

porosity with changing rank with the present conception of the fine structure of coals.

Author's abstract

Coke

Auvil, H. S. and Gayle, J. B. PHYSICAL PROPERTIES OF COKE: SIZE AND ITS MEASUREMENT. U.S. Bureau of Mines Report of Investigations 4735 (1950) October.

This paper treats by statistical methods the screen-test data obtained on coke. Samples from twelve coke oven plants, covering the range of American coking practice, were subjected to careful screen analyses. Procedures were designed so that the test data would indicate (1) degree of precision of regular tests, (2) causes of poor reproducibility in tests, and (3) possible improvements in testing procedures. Standard deviation of the screen analyses on 500 lb samples ranged from 1.2% for the 1 in. screen to 4.5% for the 5 in. screen. Closely screened fractions exhibited wide variations in size; for reproducibility of 1% in average weight per piece in 9 out of 10 cases, 1500 lb samples are needed for coke 2.5 to 2 in. Full-length pieces were such a minor portion of run-of-oven coke that their separation for use in physical tests is not recommended. Data on other physical tests of coke will be reported in similar fashion later.

O. P. Brysch

Coking

Roetheli, B. E. (assigned to Standard Oil Development Co.) METHOD FOR HANDLING FUELS. U.S. 2,527,575 (1950) October 31.

A fluidized coking process producing oil gas, gasoline, gas oils and blue gas or producer gas from heavy residual petroleum fractions is described. Coking temperatures above 800 F and up to 1200 F are employed.

H. R. Linden

Schutte, A. H. (assigned to The Lummus Co.) PROCESS FOR THE SIMULTANEOUS PRODUCTION OF COKE AND GASEOUS UNSATURATED HYDROCARBONS AND APPARATUS THEREFOR. U.S. 2,526,696 (1950) October 24.

The inventor claims a process for vapor phase cracking of residual oils in the top layers of a continuously-moving bed of hot granular material (coke) with simultaneous liquid-phase cracking in the lower portion of bed to obtain high yield of gaseous olefins and coke.

O. P. Brysch

Distribution

Boden, W. CAST IRON GAS MAINS TODAY. *Gas* (British) *No.* 2, 5-10 (1950) *September* 29.

Current British practice in the manufacture of cast iron pipe is briefly described. Spun pipe is manufactured in diameter 3 in. to 27 in. and lengths up to 18 ft. The various types of joints and their advantages and disadvantages are discussed. The use of flexible joints is encouraged. Proper handling of the pipe, causes of failure, testing, and gas flow formulas are topics which are also briefly treated.

O. T. Bloomer

High Btu Oil Gas

Blain, H. M., Jr. (assigned to The Gas Machinery Co.) PROCESS OF MAKING A COMPOSITE OIL GAS HAVING APPROXIMATELY THE CHARACTERISTICS OF NATURAL GAS. U.S. 2,522,922 (1950) *September* 19.

This patent concerns the Twin Generator Process for the production of high Btu oil gas from distillate oils. It is claimed that a gas with approximately the same combustion characteristics as natural gas can be produced. Shell heights and dimensions; operating temperatures; heat oil, make oil, steam, and make gas rates are given.

H. R. Linden

Oil Shale

Dancy, T. E. and Giedroyc, V. FURTHER RESEARCHES ON THE DETERMINATION OF THE CHEMICAL COMPOSITION OF OIL SHALES. *J. Inst. Petroleum* (British) 36, 593-603 (1950) *September*.

In an attempt to obtain the true ultimate composition of kerogen, English, French and South African oil shales were subjected to special treatment to remove mineral matter. The 3-stage chemical extraction process using (a) 1:1 HCl, (b) mixed HCl and HF, then dilute

Na_2CO_3, and (c) Zn and HCl designed to remove successfully carbonates, silicates and pyrite is effective in removal of mineral matter, but attacks the kerogen slightly. A modified Trent process removed the mineral matter as a water suspension, but only partially. Studies of both processes at various stages indicate that all shales do not behave similarly, that the Na_2CO_3 and the Zn-HCl treatments are not effective or else damage kerogens. Stage-wise physical removal and analyses, with plots of C vs ash and H vs ash, permit extrapolation to C and H content at zero ash content. Tabulations of analytical data on shales and kerogen from various steps of treatments are presented.

O. P. Brysch

Purification

Sands, A. E., Wainwright, H. W. and Egleson, G. C. ORGANIC SULFUR IN SYNTHESIS GAS: OCCURRENCE, DETERMINATION, AND REMOVAL. U.S. Bureau of Mines Report of Investigations 4699 (1950) July.

Results obtained in the Bureau of Mines' investigation of synthesis gas purification indicate that: (1) no thiophene is formed in synthesis gas made from pulverized coal, steam, and oxygen in the Bureau's pilot plants; (2) the amounts of H_2S and organic sulfur formed in the gas were reduced by adding hydrated lime to the coal used; (3) the organic sulfur concentration in the gas varied with coal rank, steam to coal ratio, and other operating conditions; and (4) for given operating conditions, increasing the steam to coal ratio greatly reduced the organic sulfur concentration in the gas. A number of analytical methods were tested for determination of total organic sulfur. It was found that the I.G.T. method, as modified by the Bureau, appeared to be the most satisfactory of the combustion methods studied, and that a modification of the Referees' method would also give accurate results. A procedure employing the Betz-Hellige turbidimeter was devised for determining as little as 0.0001 grain of sulfur as $BaSO_4$ in 250 ml of solution. Another turbidimetric procedure employing a Beckman spectrophotometer was developed for determining as little as 0.001 grain of sulfur as $BaSO_4$ in 250 ml of solution. Conversion of organic sulfur to H_2S by passage over activated alumina or a platinum spiral was studied and the latter method, as described by Lusby, was adopted for reasons of sensitivity, accuracy, and speed. The catalytic conversion of organic sulfur in the presence of large amounts of H_2S was considered for purification, but was found unsuitable for complete elimination of organic sulfur from synthesis gas. Experiments with Huff catalysts, which simultaneously remove organic sulfur and H_2S, indicated that purification down to less than 0.1 grain of total sulfur per 100CF in treated gas was possible. Limited work was done using cobalt molybdate, platinum on activated alumina, and alkalized iron catalysts for sulfur removal. Activated charcoal samples were evaluated for thiophene removal at atmospheric pressure and for carbon oxysulfide removal at 300 psig.

H. Hakewill

Shaw, J. A. (assigned to Koppers Company, Inc.) GAS PURIFICATION PROCESS. U.S. 2,524,088 (1950) October 3.

Desirable modifications are claimed for previously patented processes for removing organic sulfur compounds from industrial gases by absorption with oil solutions of amines, particularly secondary amines such as piperidine, morpholine, homologs of these, and hydrogenated tar bases. A novel feature of the process described is the use of phenol or other weakly acidic organic or inorganic compounds in conjunction with the amine absorbent to form a reaction product which permits employment of higher amine concentrations by reducing vapor losses of free amine from scrubbing solutions. Organic sulfur compounds displace the weak acid from the amine-acid reaction product and combine with the amine to form amine-sulfur complexes. Creosote oils are the preferred scrubbing medium because the amine-sulfur complexes formed dissolve more readily in such oil than in mineral oils. Means are also claimed for continuously revivifying scrubbing solutions containing amine-sulfur complexes without excessive amine losses. Decomposition of amine-sulfur complexes is effected by treatment with steam, under which conditions the acidic action of the phenol present in the solution aids substantially in the release of volatile organic sulfur compounds and in the retention of the basic amine.

H. Hakewill

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Brenner, E. C. GASES FOR SUPPLEMENTING NATURAL GAS IN MILWAUKEE. p. 217

Henry, H. M. INTERCHANGEABILITY OF GASES. p. 217

Mukherjee, B. and Dutta, R. A NOTE ON THE CONSTITUENTS OF THE ASHES OF INDIAN COAL DETERMINED SPECTROSCOPICALLY. p. 232

Ruff, C. L. HOW DETROIT INCREASED SPACE-HEATING CAPACITY TO SUPPLY 100,000 NEW CUSTOMERS. p. 223

Shnidman, L. and Yeaw, J. S. THE EFFECT OF THE COMPONENTS OF FUEL GASES ON BURNER FLAME CHARACTERISTICS AND INTERCHANGEABILITY. p. 217

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Carbon Disulfide

Folkins, H. O., Miller, E., and Hennig, H. CARBON DISULFIDE FROM NATURAL GAS AND SULFUR. REACTION OF METHANE AND SULFUR OVER A SILICA GEL CATALYST. *Ind. Eng. Chem.* 42, 2202-2207 (1950) *November.*

A laboratory investigation of the preparation of carbon disulfide from methane and sulfur is reported. 90% conversion in a once-through operation at temperatures of about 600 C is reported. Silica gel was employed as a catalyst. The effect of certain operational variables such as space velocity, temperature, and sulfur to methane ratio is included in the report.

J. D. Parent

Compression

Farrar, G. L. THERMODYNAMICS OF NATURAL GAS COMPRESSION. *Petroleum Engr.* 22C, 23, 24, 26, 29, 30 (1950) *November.*

Equations are presented for the compression of natural gas. Very little is given for non-ideal gases.

J. D. Parent

Abstractor's note: This is a review and contains nothing new.

Corrosion

Peabody, A. W. PLANNING A CORROSION CONTROL PROGRAM: IV. REVIEW MAINTENANCE STANDARDS AND PRACTICE. CHOOSING BETWEEN GALVANIC ANODES AND RECTIFIERS. *Gas* 26, 67-69 (1950) *November.*

Competent examination of maintenance standards and practices should be a preliminary part of a corrosion control program. It is not impossible to find several practices which if changed or modified would prevent considerable corrosion or at least prepare the system for a corrosion control program. Since no sharp dividing line exists between the use of galvanic anodes and rectifiers it is a preferred practice to let each installation be decided by local conditions and economics for the installation.

B. E. Hunt

Distribution

Ruff, C. L. HOW DETROIT INCREASED SPACE-HEATING CAPACITY TO SUPPLY 100,000 NEW CUSTOMERS. *Gas* 26, 28-32 (1950) *September.*

Rapid progress toward completion of the Michigan Wisconsin Pipe Line Company's construction program brought about removal of restrictions on the use of gas for space-heating on August 1, 1949. It was necesary to install 86,500 house regulators during 1949 before the peak of the spaceheating season. Details of the procedure used are presented. The cost per service was $21.20.

C. L. Tsaros

Smith, H. C. WHAT DO WE FIND WHEN WE CHANGE TO NATURAL GAS. *Gas Age* 106, 28, 29, 64-66 (1950) *October* 12.

The results of a survey of conversions for manufactured or mixed gas to natural gas are presented. Fifteen different conversion jobs were discussed as to method.

D. L. Nicol

Hydrogen Sulfide

Cunningham, W. A. HYDROGEN SULFIDE IN WEST TEXAS. *Ind. Eng. Chem.* **42**, 2238-2241 (1950) *November.*

Production of hydrogen sulfide from oil and natural gas fields in West Texas and New Mexico is equivalent to almost 400 tons of sulfur per day. About 60% of this is removed from the gas before the gas is passed into pipe lines; most of the hydrogen sulfide is disposed of in open flares. Production is widely scattered and only two plants handle a sulfur equivalent of more than 50 tons/day.

O. T. Bloomer

Espach, R. H. SOURCES OF HYDROGEN SULFIDE IN WYOMING. *Ind. Eng. Chem.* **42**, 2235-2237 (1950) *November.*

It is estimated that over 6,500,000 tons of hydrogen sulfide could be recovered from petroleum and natural gas produced in Wyoming. 500 tons of elemental sulfur could be produced daily for at least 25 years. Two sulfur plants are now in operation; one is designed to produce 365 tons/day and the other 60 tons/day. The value and potentialities of recovering this sulfur for use within the surrounding area are briefly reviewed.

O. T. Bloomer

LP-Gas

Alden, R. C. THE AVAILABILITY OF LPG FOR DIRECT MOTOR FUEL USE. *Petroleum Processing* **5**, 1180-1186 (1950) *November.*

It is proposed that LPG will be widely used as a motor fuel in the near future and that an adequate supply at a price less than that paid for gasoline will be available.

J. D. Parent

Odorization

Powell, J. S. SELECTING AN ODORANT FOR NATURAL GAS. PART 1. *Gas* **26**, 53-55 (1950) *October.*

Requirements an ideal odorant should meet are set forth. Properties and reactions of types of compounds presently employed in commercial odorants (mercaptans, disulfides, thioethers, and carbon-sulfur ring compounds) are discussed with emphasis on soil adsorption, equipment corrosion, and pilot stoppage. A procedure is given for computing the quantity of odorant a gas will hold under any pressure and temperature conditions. In the author's opinion, cyclic compounds containing carbon and sulfur in the ring structure are the most ideal odorants from the standpoint of chemical stability.

H. Hakewill

Powell, J. S. SELECTING A NATURAL GAS ODORANT. PART 2. *Gas* **26**, 36-38 (1950) *November.*

Requirements for odorants are reviewed and the differences in opinion encountered in the evaluation of odorants are discussed. A method for determining odorization rate based on the preparation of standard samples of nitrogen odorized with various types of odorants is described using room tests for determining the lowest concentration of odorant perceptible by odor. It is claimed that all the sulfur odorants and their products of combustion are physiologically harmless in the concentrations to which people would be exposed. Analytical test procedures are suggested for checking diffusion of odorant to all parts of the test area, and the use of odorometers is discussed. If the rate of odorization is adequate to warn against dangerous leakage and not more than six leak complaints per 1000 meters per month are received, the nature of the odorant and odorization rate are considered satisfactory.

H. Hakewill

Pipe Lines

Gibbon, A. CONCRETE-COATED PIPE FOR SWAMPY TERRAIN. *World Oil* **131**, 247, 248, 251 (1950) *November.*

Utilizing an extension process, a method has been perfected for applying a very dry mix of concrete to the outside of vertically held sections of pipe. Several photographs showing equipment used and the stages in the process are included. The heavily coated pipe is handled with the same equipment as when using any plant coated type of pipe protection. The pipes may be coated to any negative buoyancy requirement.

O. T. Bloomer

Stormont, D. H. "SUPER INCH" GAS LINE IS COMPLETED. *Oil Gas J.* 49, A54-A56 (1950) *November* 9.

The 501-mile "super inch" line of Pacific Gas and Electric Co. will shortly be transporting natural gas from West Texas and the Panhandle to the San Francisco area. This line which joins the El Paso Natural Gas Co. line at the California border will have an ultimate capacity of 400 MMcf daily and was built at a cost of $63,300,000. An innovation in the line's construction was a portable "double ending" plant where 32 ft joints were welded into 64 or 96 ft sections.

O. T. Bloomer

Production

Barry, A. F. METHOD AND MEANS FOR SEPARATING HYDROCARBON LIQUIDS AND WATER FROM HIGH-PRESSURE GAS STREAMS. U.S. 2,528,028 (1950) October 31.

It is desired to remove as much liquid water and hydrocarbon as possible in separators while avoiding plugging of flow lines due to hydrate formation. Liquids are first removed in the usual way, and then the pressure is reduced to a value corresponding to maximum hydrocarbon liquid recovery. The cooling effect causes further liquid formation and may even cause hydrates to form. Another separator is used in order to separate the gas from the condensed materials. The gas leaves saturated with moisture at a temperature less than that in the gathering line. The condensed material falls to a warm zone and is removed with the aid of a liquid level controller. The warm zone is provided by heat exchange with the inlet gas. The device is intended primarily for condensate.

J. D. Parent

Fletcher, C. D. GAS LIFT PRINCIPLES AND PRACTICE. PART 4. *World Oil* 131, 155, 156, 158, 160, 162 (1950) *October*.

This is the concluding article in the four part series on gas lift principles and practices. Flow by "aeration" is discussed in this section. The two types of valves used in aeration lifting, namely automatic differential, and continuous flow, are described and the advantages of each are cited. Methods and equations for calculating the maximum operating depth, points of injection, valve spacing, and efficiency aeration lifting are presented.

O. T. Bloomer

Harper, B. M., Jr. INHIBITOR IN STICK FORM STOPS CORROSION IN LOUISIANA GAS WELL. *Petroleum Engr.* 22B, 54, 56, 58, 61, 66 (1950) *November*.

A description is given of the use of inhibitor in stick form in stopping corrosion in a gas distillate well. Appended is a field method for determining the iron content of produced waters.

B. E. Hunt

Huber, T. A., Allen, T. O., Abendroth, G. F. AVERAGE COMPLETION COST IS 20 PER CENT OF TOTAL WELL COST. *Oil Gas J.* 49, 234, 237, 238, 241, 242, 244, 247, 248, 251, 253, 254, 256, 259, 261, 262, 265 (1950) *November* 16.

This is a rather lengthy article covering many aspects of well completion. Recent advances in cementing, perforation, sand exclusion and logging are discussed.

J. D. Parent

Munk, W. P. OIL AND GAS SEPARATOR. U.S. 2,528,448 (1950) October 31.

This invention relates to an oil and gas separator, particularly for oil wells during pumping. A down flow space for separation and an up flow space for liquid is provided in such a way that turbulence and gas locking can be avoided.

J. D. Parent

Soltes, E. D. "MOST ECONOMICAL" GAS PLANT. *Petroleum Engr.* 22C, 34-36 (1950) *November*.

A very economical small size plant designed for a variable load is described. Design conditions are: capacity 7MMcf to 14MMcf of wet gas per day, absorber pressure of 75 to 200 psig, propane recovery of 75% from a gas containing 2 gallons of recoverable liquid per Mcf, and production of propane, butane and 18/70 gasoline. An absorber, rich oil deethanizer, stripper, debutanizer and depropanizer are used.

J. D. Parent

Tillery, J. H. SECONDARY RECOVERY IN LOUISIANA. *World Oil* 131, 155-158 (1950) *November.*

A summary table of secondary recovery projects now in operation in Louisiana is presented. Such programs are now in operation in 18 oil and gas fields. The performance of the Lingville field in Beauregard Parish is reviewed as an example of the additional recovery of hydrocarbons that may be obtained by secondary recovery. Water flooding this field has increased the ultimate recovery to an estimated 4.6 million barrels as compared to a primary recovery of 2.2 million barrels.

O. T. Bloomer

Wilcox, Q. L. NEW ORISKANY SAND GAS POOL. *Oil Gas J.* 49, 91-93 (1950) *November* 23.

Leidy gas field on the Wellsboro anticline in Clinton County, Pa. is another prolific gas pool found in the Oriskany sandstone (named for a lower Devonian sand). The completed producers range in size from 3 to 50 MMcf per day. The field is at least 1 mile by 4 miles. Rock pressure is about 4,200 psi.

J. D. Parent

Purification & Dehydration

Chapin, W. F. (assigned to The Fluor Corp., Ltd.) PURIFICATION AND DEHYDRATION OF GASES. U.S. 2,518,752 (1950) August 15.

In the two-stage operation for H_2S and CO_2 removal from natural and refinery gases by means of an acid gas absorbent followed by moisture removal by means of a moisture absorbent, the transfer of moisture absorbent into the acid gas absorbent during the regeneration cycle is fully and automatically compensated by the system proposed in the present invention.

H. Hakewill

Transmission

Overbeck, J. E. LARGE VOLUME GAS MEASUREMENT. Paper presented at the Annual Meeting of the American Gas Association, Operating Section, Atlantic City, October, 1950.

This article is a survey of methods and practices which have been found practical for measurement of large volumes of gas. These methods may be divided into (1) orifice meters, and (2) large capacity displacement meters. The section on orifice meters presents a summary of the method of calculating orifice meter deliverabilities and is based on Report No. 2 of the Gas Measurement Committee of the American Gas Association. In the section on displacement meters, pertinent factors in the selection and use of diaphragm and impeller type meters are briefly discussed.

O. T. Bloomer

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Boden, W. CAST IRON MAINS TODAY. p. 221

Brenner, E. C. GASES FOR SUPPLEMENTING NATURAL GAS IN MILWAUKEE. p. 217

Chu, J. C., Mueller, N. F., Busche, R. M. and Jennings, A. S. THERMODYNAMIC PROPERTIES OF PROPANE. p. 233

Culberson, O. L. and McKetta, J. J., Jr. PHASE EQUILIBRIA IN HYDROCARBON-WATER SYSTEMS. p. 232

Henry, H. M. INTERCHANGEABILITY OF GASES. p. 217

Shepard, E. R. and Graesser, E. J., Jr. DESIGN OF ANODE SYSTEMS FOR CATHODIC PROTECTION OF UNDERGROUND AND WATER SUBMERGED METALLIC STRUCTURES. p. 235

Shnidman, L. and Yeaw, J. S. THE EFFECT OF THE COMPONENTS OF FUEL GASES ON BURNER FLAME CHARACTERISTICS AND INTERCHANGEABILITY. p. 217

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Fischer-Tropsch Synthesis

Crowell, J. H., Benson, H. E., Field, J. H. and Storch, H. H. FISCHER-TROPSCH OIL CIRCULATION PROCESSES. *Ind. Eng. Chem.* 42, 2376-2384 (1950) *November.*

Process development of the Fischer-Tropsch synthesis is reviewed. Pilot plant studies at the Bureau of Mines of the oil circulation method with a fixed bed failed after 3 or 4 months when the catalyst particles became cemented together and caused an excessive pressure differential across the catalyst bed. Use of a moving bed of catalyst particles suspended in the recirculated oil overcame this defect. Details are given of the induction and synthesis operations, yields and product distribution. The process has the ability to utilize synthesis gases containing hydrogen and carbon monoxide in the ratio of 1-to-1.

C. H. Riesz

Phinney, J. A., Pace, B. S., Ayton, G. R. (assigned to Stanolind Oil & Gas Co.) HYDROGEN-CARBON MONOXIDE SYNTHESIS. U.S. 2,527,846 (1950) October 31.

The carbon monoxide concentration of the synthesis gas contacting a fluidized iron catalyst is maintained at a suitably low value. This is achieved by maintaining the H_2:CO:CO_2 mixture in the proportions 2-6 : 1:1-3 and adjusted to give a Z number of 3 to 9 where Z is defined as the quotient, $(H_2)\ (CO_2)/(CO)^2$. The desired gases may be obtained by recycling tail gases from the hydrocarbon synthesis step.

C. H. Riesz

Fuel Gases

Scharmann, W. G. (assigned to Standard Oil Development Co.) PRODUCTION OF FUEL GASES. U.S. 2,527,154 (1950) October 24.

The tail gas from Fischer-Tropsch synthesis of liquid hydrocarbons is passed over a hydrogenating catalyst under hydrogenating conditions to effect methanization and to saturate gaseous olefins. Nickel catalyst may be used at temperatures of 500-850° F and at pressures of 100-1000 psig. The process may utilize a fluidized catalyst bed. After removal of carbon dioxide, the gas has a high heating value, e.g., 1000 Btu per cu. ft., suitable for use by the gas industry.

C. H. Riesz

Hydrogen

Shapleigh, J. H. (assigned to Hercules Powder Co.) HYDROGEN PRODUCTION. U.S. 2,524,840 (1950) October 10.

Liquid as well as gaseous hydrocarbons are gasified with steam in contact with a cracking catalyst, e.g., nickel promoted by alumina, at temperatures above 1200° F. The novelty claimed for the invention lies in the mixing and injection of the steam-hydrocarbon mixture as a means of preheating the hydrocarbon feed. Superheated steam is mixed with the hydrocarbon feed and the mixture is injected at a considerable distance within the reaction tube; secondary steam surrounds the injection tube and also mixes at the outlet of the injection tube.

C. H. Riesz

Methane Synthesis

Binder, G. G. and White, R. R. SYNTHESIS OF METHANE FROM CARBON DIOXIDE AND HYDROGEN. *Chem. Eng. Progress* **46**, 563-574 (1950) *November.*

The rate of formation of methane from carbon dioxide and hydrogen over a reduced nickel catalyst were determined for various mixtures of these gases as well as one containing 13% methane. The temperature range investigated was 500-750° F. A pressure of one atmosphere was used in all runs. The average rate of methane formation varied from 0 to 5.60 lb. moles/day-lb. of catalyst. Carbon monoxide in amounts not exceeding 3.5% was also formed. Carbon formation was negligible. Various reaction mechanisms were studied and the surface reaction appears to be rate-controlling. The rate of reaction can be correlated for a mechanism which assumes that the major resistance is offered by the reaction of an adsorbed carbon dioxide molecule with at least two adsorbed hydrogen molecules, the latter possibly dissociated. Two equations are given which represent

the extremes of the range of acceptable mechanisms and which reproduce the experimental data almost equally well.

C. H. Riesz

OXO Reaction

Wender, I., Orchin, M. and Storch, H. H. MECHANISM OF THE OXO AND RELATED REACTIONS. III. EVIDENCE FOR HOMOGENEOUS HYDROGENATION. *J. Am. Chem. Soc.* **72**, 4842-4843 (1950) *October.*

Evidence is presented to show that hydrogenations occurring in the presence of cobalt and a high partial pressure of carbon monoxide are homogeneous. Either dicobalt octacarbonyl $[Co(CO_4)]_2$ or cobalt hydrocarbonyl, $HCo(Co)_4$ is formed; it is soluble in the substrate and functions as the catalyst. Hydrogenation occurs in the presence of hydrogen alone, but is poisoned by an amount of carbon monoxide insufficient to form the carbonyl form of catalyst. In the presence of sulfur compounds, the homogeneous hydrogenation is not poisoned while, with hydrogen alone, hydrogenation is greatly retarded.

C. H. Riesz

Wender, I., Levine, R., and Orchin, M. CHEMISTRY OF THE OXO AND RELATED REACTIONS. II. HYDROGENATION. *J. Am. Chem. Soc.* **72**, 4375-4378 (1950) *October.*

Aldehydes and ketones are reduced to alcohols by means of synthesis gas (CO and H_2) in the presence of a cobalt catalyst. Compounds containing sulfur can be reduced by this method. A free radical mechanism is proposed involving the formation of either dicobalt octacarbonyl or cobalt hydrocarbonyl. Olefins are hydroformylated in one step to alcohols containing one carbon atom more than the olefin.

C. H. Riesz

Petrochemicals

Egloff, G. CHEMICALS FROM NATURAL GAS AND PETROLEUM. *Oil Gas J.* **49**, 69-72, 81 (1950) *November* 2.

Over 3 billion pounds of natural gas and petroleum compounds are used yearly for the production of chemicals. Various processes and products are discussed.

C. H. Riesz

Sweeney, W. J. PROGRESS IN PETROCHEMISTRY—A TECHNICAL REPORT. *Oil Gas J.* **49**, 74, 75, 77, 80, 81 (1950) *November* 2.

Chemicals utilizing ethylene, propylene and butylenes as starting materials are discussed. Petrochemicals are also available from various other refinery sources.

C. H. Riesz

MAGIC OF PETROCHEMISTRY OPENS NEW HORIZONS FOR OIL AND GAS. *Oil Gas J.* **49**, 50-72, 81 (1950) *November* 2.

This is a special survey on companies active in the petrochemical industry. Abstracts of the portions of this survey most directly connected with the gas industry follow.

PHILLIPS CHEMICAL CO.: This subsidiary of Phillips Petroleum Co. is a leading producer of petrochemicals. An ammonia plant of 154,000 tons per year capacity is maintained at Etter, Texas. Ammonium nitrate is also made at that location. Natural gas provides the hydrogen required for the synthesis of ammonia. At Houston, there is an ammonium sulfate plant of 250,000 tons per year capacity. A copolymer synthetic rubber plant of 45,000 long tons per year capacity is operated at Borger. Butane is one of the raw materials in this process. In addition to these facilities, the company operates the world's largest furnace-black plants (100,000 tons per year capacity) at Borger. SPENCER CHEMICAL CO.: This company converts natural gas to a variety of products including ammonia, ammonium nitrate and methyl alcohol. The Chicago Works produces about 50 tons of formaldehyde per day from methanol. MATHIESON CHEMICAL CORP. & TENNESSEE GAS TRANSMISSION CO.: These have formed a new company, Mathieson Hydrocarbon Chemical, to make a variety of organic chemicals, principally ethylene glycol, in a plant to be constructed in Kentucky. LION OIL COMPANY: Lion Oil Co. has taken over and enlarged the Ozark Ordnance Works at El Dorado, Arkansas. The basic product here is anhydrous ammonia and plant capacity is 570 tons per day. Some of the

ammonia is converted to ammonium nitrate and ammonium sulfate. The nitric acid required is made from ammonia. SAN JACINTO CHEMICAL CORP: Using the equipment of the former Missouri Ordnance Works they have a plant capacity of 70 tons per day of ammonia. Natural gas is the raw material. E. I. DU PONT DE NEMOURS & CO: At their Sabine River Works in Texas, they are making methanol, polythene plastic and nylon intermediates. Methanol is made from natural gas, and polythene is made from ethylene produced from propane. Ethylene is also a raw material for the production of orlon synthetic fiber. At Victoria, Texas DuPont is erecting a plant for the manufacture of nylon intermediates. THE CELANESE CORP. OF AMERICA: They convert natural gas, propane and butane by direct oxidation into organic chemicals such as acetone, acetic acid, acetalydehyde, methanol and formaldehyde. SHELL CHEMICAL CORP: This corporation manufactures chemicals from oil and natural gas. Synthetic ammonia, fertilizer, alcohols, resins and glycerin are included in the list of products. THE DOW CHEMICAL CO: They are using considerable quantities of oil, gas and LP gases as raw materials for the manufacture of plastics, alcohols and intermediates. UNION CARBIDE & CARBON: Union Carbide is a grant producer of long standing in the petrochemical field, producing some 300 materials of which 30 are in the million-pound-per-year class. Plastics, solvents and insecticides are included among the products.

J. D. Parent

Pressure Hydrogenation

Wiley, J. L. and Anderson, H. C. BIBLIOGRAPHY OF PRESSURE HYDROGENATION. I. REVIEW AND COMPILATION OF THE LITERATURE ON PRESSURE HYDOGENATION OF LIQUID AND SOLID CARBONACEOUS MATERIALS. U.S. Bureau of Mines Bulletin 485 (1950).

Abstracts have been compiled for the entire technical literature, excluding patents, pertaining to the Bergius and related processes for hydrogenation under pressure of liquid and solid carbonaceous materials, such as coal, lignite, and their distillation and extraction products, pitches and tars, and petroleum and its distillation residues. Captured foreign documents and reports compiled on these are included. The review is dated January 1, 1949, contains 2503 abstracts and is 306 pages long. Patents will be presented in Part II and a detailed subject index will be compiled in Part III.

C. H. Riesz

Sweetening

Kalichevsky, V. A. SWEETENING AND DESULFURIZATION OF LIGHT PETROLEUM PRODUCTS. PART I. *Petroleum Refiner* **29**, 97-100 (1950) *November.*

This is the initial article of a series presenting the chemical and process considerations involved in treating gasoline and other light distillates containing sulfur. The types of sulfur compounds and their effects on petroleum quality are discussed in the first article.

C. H. Riesz

Synthesis Gas

Sands, A. E. and Schmidt, L. D. RECOVERY OF SULFUR FROM SYNTHESIS GAS. *Ind. Eng. Chem.* **42**, 2277-2287 (1950) *November.*

Processes for the removal of sulfur from gas are considered. For synthesis purposes, the total sulfur should not exceed 0.1 grain per 100 cubic feet; for methanation an upper limit of 0.002 grains has been suggested. Costs for the removal of hydrogen sulfide by the triethanolamine process were estimated for various plant sizes and sulfur concentrations. The net cost after allowance for sulfur recovery was about 0.5 cents per Mcf when the sulfur content of the coal used for generating synthesis gas was 0.5-1.0%; the net cost decreased with increasing sulfur in the coal until the net cost was zero at 5% sulfur in the coal. The net cost for organic sulfur removal by activated carbon followed the same pattern with values in the range 1.0-0.5 cents per Mcf. Because of the large scale of the synthesis gas plants (300 million to 1 billion cubic feet per day) and the many factors involved, these cost estimates should serve as guides rather than as absolute values.

C. H. Riesz

Voorhies, A., Jr. (assigned to Standard Development Co.) PRODUCTION OF GAS MIXTURES CONTAINING CO AND H. U.S. 2,526,521 (1950) October 17.

In a process for interacting steam, carbon dioxide and gaseous hydrocarbons in the presence of a catalyst at temperatures of about 900° to 1700°F, it is claimed that a substantial portion of the carbon dioxide must be added above about 1200-1300°F to avoid carbon deposition.

C. H. Riesz

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Feldman, K. T. and Watkins, F. M. NEW CORROSION INHIBITOR GETS JOB DONE. p. 235

Folkins, H. O., Miller, E. and Hennig, H. CARBON DISULFIDE FROM NATURAL GAS AND SULFUR. . .p. 223

Hicks, T. G. PLANNING REFINERY HEAT TRANSFER EQUIPMENT. PART III. ECONOMICAL PROPORTIONS. p. 234

Woolfolk, E. O., et al. CHARACTERIZATION OF TAR ACIDS FROM COAL-HYDROGENATION OILS. p. 231

7. ANALYTICAL METHODS AND TESTS

Carbon Monoxide Absorption

Ray, G. C. and Johnson, P. H. (assigned to Phillips Petroleum Company) METHOD OF ABSORBING CARBON MONOXIDE. U.S. 2,519,284 (1950) August 15.

An improved method for absorbing and recovering carbon monoxide is presented and the equipment required is diagrammatically illustrated. The invention provides a solvent for cuprous salts which can be used in a scrubbing tower of conventional design for effective removal of CO from water gas, blue gas, producer gas, flue gas, and the like. In the process ortho-anisidine is used for dissolving up to 20% of its weight of cuprous salts such as cuprous chloride. Desorption of CO from the scrubbing solution is accomplished by pressure reduction or heat.

H. Hakewill

Coal Tar

Green, S. J. and Thakur, B. THE INSOLUBLE MATTER OF COAL TAR. VI. OXIDATION OF FREE CARBON. *J. Soc. Chem. Ind.* (London) 69, 238-244 (1950) *August.*

Experimental step-wise oxidation of free carbon with several different concentrations of alkaline potassium permanaganate is described. Bulk oxidation of free carbon and the fractionation of the products into carbon dioxide, humic acid, acetic acid, oxalic acid and benzenoid acids are reported. The pyridine-insoluble part of free carbon (C_1) and also that obtained by centrifuging tar were similarly investigated and compared with the C_2 fraction and tar resins, as well as with coal and coke. The C_1 fractions are more graphitized than a bituminous coal. Three-fused-ring types of compounds occur in the products of oxidation of humic acids. C_1 and C_2 appear to be quite different, the latter resembling tar resins.

O. P. Brysch

Continuous Analyzers

Thomas, B. W. CONTINUOUS ANALYZERS. *Instruments* 23, 1130, 1131, 1137 (1950) *November.*

The development and application of reliable instruments for indicating process operating variables and controlling process operations are discussed. Specific types of instruments included are: non-dispersion infrared analyzer, dielectric constant meter, densitometer or gravitometer, refractometer, and viscometer. Applications of the infrared analyzer of possible interest to the gas industry are the measurement of CO_2 in air, CO in flue gases, and ethane or isobutane in LPG propane. The author anticipates substantial expansion in the use of continuous recorder-controller analyzers for industrial purposes during the next five to ten years.

H. Hakewill

Mass Spectrometer

Purdy, K. M. and Harris, R. J. INTRODUCTION OF LIQUID SAMPLES INTO THE MASS SPECTROMETER. *Anal. Chem.* 22, 1337-1339 (1950) *October.*

A constant-volume capillary pipet is described which enables a constant volume of liquid to be introduced into the mass spectrometer vacuum system directly through a sintered glass disc covered by a pool of mercury. Accurate and reproducible volumes of liquids are entered in this manner without contamination by air.

D. V. Kniebes

Shepherd, M. MASS SPECTROMETRIC ANALYSIS OF A STANDARD SAMPLE OF CARBURETTED WATER-GAS BY LABORATORIES COOPERATING WITH THE AMERICAN SOCIETY FOR TESTING MATERIALS. *J. Research, Natl. Bur. Standards* 44, 509-529 (1950) *May.*

A standard sample of carburetted water gas was analyzed in twenty-seven laboratories by mass spectrometric methods. Frequency-distribution plots of the resulting analyses indicated the reproducibility and, in certain respects, the accuracy obtained. Need for improvement with respect to the determination of nitrogen, carbon monoxide and hydrogen was noted.

D. V. Kniebes

Sulfur in Coal

Mott, R. A. RAPID DETERMINATION OF PYRITIC AND SULFATE SULFUR IN COAL. *Gas J.* (British) 264, 44 (1950) *October* 4.

Modified digestion techniques have been devised which reduce the time required for extraction of sulfate and pyritic sulfur from coal from 40 hrs and 24 hrs respectively, to 30 minates for each. By the new procedure, sulfate sulfur is dissolved from a crushed coal sample with 16% HCl maintained at the boiling point for 30 minutes; and pyritic sulfur is dissolved by boiling for 30 minutes with 2N HNO_3. Evidence is cited to illustrate improved precision achieved with the shortened method, and to compare results obtained using the old recognized and the new improved digestion procedures.

H. Hakewill

Tar Acids

Woolfolk, E. O., Columbic, C., Friedel, R. A., Orchin, M. and Storch, H. H. CHARACTERIZATION OF TAR ACIDS FROM COAL—HYDROGENATION OILS. U.S. Bureau of Mines Bulletin 487 (1950).

The various chemical and physical techniques used in isolating and identifying the phenolic compounds which occur in oils from coal hydrogenation are presented. Spectrometric data is given for many pure compounds.

O. P. Brysch

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Dudenbostel, B. F., Jr. DETERMINATION OF AROMATICS IN HYDROCARBON MIXTURES. p. 232

Mukherjee, B. and Dutta, R. A NOTE ON THE CONSTITUENTS OF THE ASHES OF INDIAN COAL DETERMINED SPECTROSCOPICALLY. p. 232

Sands, A. E., Wainwright, H. W. and Egleson, G. S. ORGANIC SULFUR IN SYNTHESIS GAS. . . p. 222

8. GENERAL AND PHYSICAL CHEMISTRY

Bunsen Flame

Grove, J. R., Hoare, M. F. and Linnett, J. W. THE SHADOW CAST BY A BUNSEN FLAME, ITS PRODUCTION AND USEFULNESS. *Trans. Faraday Soc.* (British) 46, 745-755 (1950) *September.*

The mode of formation of the shadow cast by the inner cone of a Bunsen flame was studied for possible use as a measure of burning velocity. Using the measured burning velocity by Schlieren photographs as being the most reliable, the burning velocity measured by the inner edge of the shadow cone can be corrected to this value by the use of an empirical equation obtained by experiment.

D. L. Nicol

Charcoal Adsorption

Razouk, R. I. and ElGobeily, M. A. THE EXPANSION OF CHARCOAL UPON THE ADSORPTION OF GASES AND VAPORS. *J. Phys. & Colloid Chem.* **54**, 1087-1098 (1950) *November.*

The expansion of charcoal following adsorption of methanol, ammonia, carbon dioxide, oxygen and sulfur dioxide was measured mechanically. The expansion was found to be proportional to the lowering of the surface free energy, and appeared to be independent of temperature and adsorbate. Adsorption was less than monomolecular, even close to saturation.

S. Katz

Emission Spectroscopy

Mukherjee, B. and Dutta, R. A NOTE ON THE CONSTITUENTS OF THE ASHES OF INDIAN COAL DETERMINED SPECTROSCOPICALLY. *Fuel* (British) **29**, 190-192 (1950) *January.*

The ashes of a number of Indian coals were examined spectroscopically and the presence of over thirty elements was established. Experimental procedures are described in detail, including a qualitative determination of the germanium content.

S. Katz

Equation of State

Drenan, J. W. and Hill, T. L. A STUDY OF THE TWO-COMPONENT VAN DER WAALS FLUID. *J. Phys. & Colloid Chem.* **54**, 1132-1148 (1950) *November.*

The partition function for a 2 component system covering both liquid and gaseous phases is derived using the statistical model which leads up to Van der Waal's equation of state. The dependence of the equation of state for this system, critical constants, and vapor-liquid equilibrium on Van der Waal's constants are studied. An alternative method using chemical potentials for liquid-vapor equilibrium system is studied. A comparable discussion for a two component, two dimensional system is also given.

S. Mori

Phase Equilibria

Culberson, O. L. and McKetta, J. J., Jr. PHASE EQUILIBRIA IN HYDROCARBON-WATER SYSTEMS. II. THE SOLUBILITY OF ETHANE IN WATER AT PRESSURES TO 10,000 PSI. T.P. 2932 *Petroleum Trans. AIME* **189**, 319-322 (1950); *J. Petroleum Technol.* **2**, (1950) *November.*

The solubility of ethane in water is reported for pressures to 10,000 psi and in the temperature range of 100 to 340 F. It is considerably less than the solubility of natural gas in water as reported by Standing and Dodson. About 8 cu ft of ethane will dissolve in one barrel of water at 100 F and 10,000 psi.

J. D. Parent

Radioactive Isotopes

Taylor, H. D. RADIOACTIVE ISOTOPES IN CHEMICAL AND INDUSTRIAL RESEARCH. *Bull. Brit. Coal Utilization Research Assoc.* **14**, 293-301 (1950) *August.*

The extreme use of radioactive materials in modern research is summarized. The limits of detection are given together with a brief description of detecting materials. A large variety of qualitative and quantitative analytical applications are indicated. Other applications have included solubility and vapor pressure studies, adsorption and surface area, diffusion and self-diffusion, and reaction kinetics. A bibliography of 106 papers is given.

S. Katz

Raman Spectroscopy

Dudenbostel, B. F., Jr. (assigned to Standard Oil Development Co.) DETERMINATION OF AROMATICS IN HYDROCARBON MIXTURES. U.S. 2,527,121 (1950) October 24.

Raman spectroscopy is employed for the determination of total aromatics in a hydrocarbon mixture. It is stated that the determination is made more precise by measuring the area of the intensity peak, rather than the peak height.

S. Katz

Thermal Diffusion

Robb, W. L. and Drickamer, H. G. TRANSPORT PROPERTIES OF DENSE MEDIA. I. THERMAL DIFFUSION IN ISOTOPIC MIXTURES OF GASES. *J. Chem. Phys.* 18, 1380-1382 (1950) *October.*

The paper presents a derivation of the thermal diffusion ratio which can be evaluated from the equation of state. Experimental data near the critical point are presented as curves and the calculated curves are also presented. There is only qualitative agreement. The paper presents no experimental methods.

R. E. Peck

Thermodynamic Properties of Propane

Chu, J. C., Mueller, N. F., Busche, R. M. and Jennings, A. S. THERMODYNAMIC PROPERTIES OF PROPANE. *Petroleum Processing* 5, 1203-1204 (1950) *November.*

The authors have constructed a temperature-entropy chart for propane which covers a range from 100 to 460 F and 14.7 to 10,000 psia. The range covered in this chart is more extensive than that of previous charts and greater accuracy, resulting from more up-to-date data and rigorous methods of calculations, is claimed for the chart. The enthalpy and entropy of the saturated vapor at different temperatures are calculated by the residual volume method. The saturated liquid entropy and enthalpy values are computed through values of latent heat of vaporization. A T-S chart and a table of thermodynamic properties are neatly presented. Low temperature data which is becoming increasingly important is not covered by the paper.

K. N. Rao

Thermodynamics

Manes, M., Hofer, L. J. E. and Weller, S. CLASSICAL THERMODYNAMICS AND REACTION RATES CLOSE TO EQUILIBRIUM. *J. Chem. Phys.* 18, 1355-1361 (1950) *October.*

Equations are derived to determine the magnitudes of forward and reverse reaction rates at equilibrium from rate observations close to equilibrium. Measurements of this kind may be used to analyze the kinetics of reversible reactions.

S. Katz

10. CHEMICAL ENGINEERING

Cooling Water Systems

Applebaum, S. B. TREATMENT OF COOLING WATER. *Combustion* 22, 41-48 (1950) *November.*

Cooling water systems of the once through, open recirculating, and closed recirculating types are briefly discussed. A list of the types of water deposits and of causes of corrosion is presented. Three ways of treating water for calcium carbonate hardness are discussed. The methods are as follows: (1) addition of acid alone; (2) lime treatment followed by acid; (3) sodium zeolite plus some hard water followed by acid.

W. J. Merwin

Fractional Permeation of Gases

Weller, S. and Steiner, W. A. ENGINEERING ASPECTS OF SEPARATION OF GASES. FRACTIONAL PERMEATION THROUGH MEMBRANES. *Chem. Eng. Progress* 46, 585-590 (1950) *November.*

Membranes of some organic materials permit more or less selective diffusion of gases. Thus, ethyl cellulose seems suitable for the fractionation of air. It is thought that this phenomenon can be utilized in the separation of gaseous components from mixtures.

J. D. Parent

Liquid Heating Systems

Geiringer, P. L. WHY USE VAPORS OR GASES WHEN IT MAY BE BETTER TO HEAT WITH LIQUIDS. *Chem. Eng.* 57, 136-138 (1950) *October.*

Liquid heating systems are better adapted to surface uniformity, close temperature control, and alternate heating and cooling processes, than vapor or gas systems. Where gradual and uniform heating is required, liquid systems may offer the only solution. Above 250 F, high pres-

sure requirements and losses due to condensate flashing discourage the rise of steam. Mercury is expensive and poisonous and air and flue gases require large ducts and the circulation of large amounts of gas. Up to 400° F, water is the best of the liquids. Between 400° and 700° F, Dowtherm A, chlorinated biphenyl (400-600° F), oils (400-500° F), and silicates are used. Between 700° F and 1000° F, salts are the best, a 50-50 mixture of sodium nitrite and potassium nitrate being widely used. High temperature salt systems are very dependable, and the investment costs are far below those of other heating equipment in the same temperature range. Steam traced pipes are used. Silicones offer promise as heat carriers in the high temperature field.

C. L. Tsaros

Separation of Gaseous Mixtures

Fausek, A. J. and I. F. METHOD OF SEPARATING THE CONSTITUENTS OF GASEOUS MIXTURES. U.S. 2,527,623 (1950) October 31.

Acetylene and other hydrocarbons are removed from compressed air before entering an oxygen column by combustion in an electrically heated furnace. The hydrocarbon combustion products, being principally carbon dioxide and water vapor, are removed by passage through a series of caustic filled pressure driers. The cleaned air is then separated into its constituents by treatment in a conventional oxygen rectification apparatus.

C. Von Fredersdorff

The following article, the abstract for which appears on the page indicated, is also called to your attention:

Robb, W. L. and Drickamer, H. G. TRANSPORT PROPERTIES OF DENSE MEDIA... p. 233

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Heat Transfer Equipment

Hicks, T. G. PLANNING REFINERY HEAT TRANSFER EQUIPMENT. PART III. ECONOMICAL PROPORTIONS. *Petroleum Refiner* 29, 113-115 (1950) *November.*

Graphs are presented showing the effect of heat transfer area, tube length and operating pressure on initial cost of a heat exchanger. Equations are given by means of which it is possible to calculate the total operating cost of an exchanger.

W. J. Merwin

Orifice Calculation

Arnold, T. H., Jr. NOMOGRAPH FOR ORIFICE CALCULATIONS. *Petroleum Refiner* 29, 123-125 (1950) *August.*

It is possible to make orifice calculations quickly by means of the nomograph which is presented.

W. J. Merwin

Thermocouples

Murphy, E. A. MEASUREMENT AND CONTROL OF PROCESS VARIABLES. PART 2. THERMOCOUPLES. *Southern Power & Ind.* 68, 66-69 (1950) *November.*

A general discussion is presented of characteristics of various thermocouples. Copper constantan is used for low temperature work, iron-constantan is used in reducing atmospheres, chromel-alumel is used in oxidizing atmospheres and platinum-platinum rhodium is used for temperatures up to 3000° F, but not where the atmosphere is alternately oxidizing and reducing. The advantages and limitations of thermocouples are briefly mentioned.

W. J. Merwin

The following article, the abstract for which appears on the page indicated, is also called to your attention:

Applebaum, S. B. TREATMENT OF COOLING WATER. p. 233

12. MATERIALS OF CONSTRUCTION

Corrosion

Carter, G. M., Jr. ANTI-CORROSION TAPE FOR SERVICE PIPES. *Gas Age* **106**, 42, 43, 76, 78 (1950) *November* 23.

The No. 22 "Scotch" brand of electrical tape consists of a polyvinyl chloride film with a pressure sensitive adhesive on one side. The procedure developed by the Minneapolis Gas Co. is discussed. A table of physical properties of the tape is included.

B. E. Hunt

Feldman, K. T. and Watkins, F. M. NEW CORROSION INHIBITOR GETS JOB DONE. *Oil Gas J.* **49**, 340-344 (1950) *November* 16.

The results are given of a 4-year testing program to prevent internal corrosion of product pipe lines with a product-soluble rust inhibitor RD-119. Having once been added to a petroleum product the protective effects of the inhibitor continue until the product is finally consumed.

B. E. Hunt

Gilbert, T. H. PERFORMANCE OF MAGNESIUM ANODES UNDER ACTUAL SERVICE CONDITIONS. *Gas Age* **106**, 40, 41, 67, 68 (1950) *November* 23.

Curves are drawn which enable a corrosion engineer to determine what length of pipe may be protected in soils of various resistivities. These curves have been constructed from field test data obtained with magnesium anodes.

B. E. Hunt

Goodwin, C. L. COATINGS AND CATHODIC PROTECTION. *Oil Gas J.* **49**, 355, 356, 359, 360 (1950) *November*.

New developments in pipeline coatings and cathodic protection are discussed. Coatings and reinforcement materials are being developed to provide good electrical resistance and high soil stress resistance. Principal sources of cathodic protection current are galvanic anodes and dry type rectifiers. Improvements have been made in the design of ground bed and anode installations.

B. E. Hunt

Kalman, F. E. CLUES TO BACTERIAL CORROSION. *Am. Gas Assoc. Monthly* **32**, 26, 30 (1950) *October*.

The modern view concerning soil corrosion indicates that soil bacteria cause changes in the physical and chemical properties of the soil which result in corrosion by differential aeration, chemical attack or deposit attack. Preventive measures will include pipe coatings, removal of organic soil from the vicinity of pipe, use of bacterial poisons, cathodic protection, selection of more resistant metals and alloys, and the use of insulating points to break "long line" electrical circuits.

B. E. Hunt

Parker, M. E. DETERMINATION OF CURRENT REQUIREMENTS FOR CATHODIC PROTECTION. *World Oil* **131**, 253, 256, 258, 260, 264, 267 (1950) *November*.

Almost any iron or steel surface may be cathodically protected from corrosion. Economic considerations may dictate the degree of protection practicable. Coated pipe, bare pipe, tank bottoms, marine structures, and tank interiors are discussed as to methods of estimating or measuring current requirements.

B. E. Hunt

Shepard, E. R. and Graeser, H. J., Jr. DESIGN OF ANODE SYSTEMS FOR CATHODIC PROTECTION OF UNDERGROUND AND WATER SUBMERGED METALLIC STRUCTURES. *Corrosion* **6**, 360-375 (1950) *November*.

Study was made of numerous anodes of different dimension and geometric shapes in both vertical and horizontal installations. Measured resistances to ground were compared with resistances calculated from equations for the resistance of hemispheres to ground, for the resistance of vertical rods to ground and from other equations. Experiments indicate that the four electrode method will be best for deter-

mining the soil resistivity. A typical design for the cathodic protection of a buried pipe line using rectifiers and graphite electrodes is presented. The factors affecting the required current density in the design of cathodic protection installations for large water tanks is discussed.

B. E. Hunt

Insulation

PRESENT AND FUTURE INSULATIONS FOR HOUSEHOLD UNITS. *Refrig. Eng.* 58, 857, 858, 914 (1950) *September.*

A panel discussion of the relative merits of seven commercial insulating materials is presented. These are Fiberglass, mineral wool, wood fiber, Flotofoam, Styrofoam, aluminum foil and Perlite. It is pointed out that conductivity is of less importance where proper filling of insulating space is not done. Actual tests of materials of identical conductivities show large differences in heat leak.

D. L. Nicol

Metals

Smith, G. V. PROPERTIES OF METALS AT ELEVATED TEMPERATURES. *Mech. Eng.* 72, 799-804 (1950) *October.*

The consideration of creep phenomena is of primary importance in the design of metal structures for use at elevated temperatures. Economical design should be based upon a limited life since deformation continues at elevated temperatures with time resulting finally in rupture. The translation of laboratory data to actual service is quite complex but is improving as further data are collected.

B. E. Hunt

The following article, the abstract for which appears on the page indicated, is also called to your attention:

Remmey, G. B. SEMISILICA REFRACTORIES LESSEN FURNACE STRUCTURAL FAILURES. p. 218

SERVICE TO READERS

Bibliographies and Literature Searches

The library will prepare bibliographies and make literature searches on a cost basis plus a fixed service charge. A comprehensive statement outlining the problem in detail must be presented with the request.

Photocopies

The library will furnish photostatic or microfilm copies of articles abstracted in GAS ABSTRACTS at cost.

Abstracts on Cards

Copies of any abstract in GAS ABSTRACTS on 5 x 8 cards will be supplied on request.

Periodicals Abstracted for GAS ABSTRACTS

American Gas Association Monthly
American Gas Journal
American Petroleum Institute Quarterly
American Society for Testing Materials Bulletin
Analytical Chemistry
Bituminous Coal Research
Blast Furnace and Steel Plant
British Abstracts
British Coal Utilization Research Association Monthly Bulletin
Butane-Propane News
California Oil World
Canadian Chemistry and Process Industries
Canadian Gas Journal
Canadian Journal of Research
Ceramic Age
Chemical Abstracts
Chemical and Engineering News
Chemical Engineering
Chemical Engineering
Chemical Engineering Progress
Chemcial Industries
Chemical Reviews
Chemistry and Industry
Coal Age
Coke and Gas
Combustion
Compressed Air
Construction Methods and Equipment
Corrosion
Engineers' Digest
Fuel Abstracts
Fuel in Science and Practice
Fueloil and Oil Heat
Gas
Gas Age
Gas and Oil Power
Gas Heat in Industry
Gas Journal
Gas Research Board Publications
Gas Times
Gas World
Heating and Ventilating
Heating, Piping and Air Conditioning
Industrial and Engineering Chemistry
Industrial Gas
Industrial Heating
Institution of Gas Engineers: Bulletins, Communications and Transactions
Instruments
Iron Age
Journal of the American Chemical Society
Journal of Applied Mechanics
Journal of Applied Physics
Journal of Chemical Education
Journal of Chemical Physics
Journal of the Chemical Society (London)
Journal of the Institute Fuel
Journal of the Institute of Petroleum
Journal of Metals
Journal of Organic Chemistry
Journal of Petroleum Technology
Journal of Physical and Colloid Chemistry
Journal of Research National Bureau of Standards
Journal of Scientific Instruments and Physics in Industry
Journal of the Society of Chemical Industry
LP Gas
Materials and Methods
Mechanical Engineering
Mining Engineering
National Gas Bulletin of Australia
National Petroleum News
Nature
Nucleonics
Official Gazette of the U.S. Patent Office
Oil and Gas Journal
Operating Engineer
Petroleum
Petroleum Engineer
Petroleum Processing
Petroleum Refiner
Pipe Line News
Power
Power Engineering
Public Utilities Fortnightly
Refrigerating Engineering
Review of Scientific Instruments
Science
Southern Power and Industry
Steel
Transactions American Society of Mechanical Engineers
Transactions of the Faraday Society
U.S. Bureau of Mines Bulletins, Information Circulars Reports of Investigations and Technical Papers
World Oil

THIS PUBLICATION IS REPRODUCED BY AGREEMENT WITH THE COPYRIGHT OWNER. EXTENSIVE DUPLICATION OR RESALE WITHOUT PERMISSION IS PROHIBITED.